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"COMMENT SOUGHT

ON MODIFYING THE SIMULTANEOUS MULTIPLE ROUND AUCTION DESIGN TO ALLOW COMBINATORIAL (PACKAGE) BIDDING"

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A Simple Approach to Easing
Threshold Problems in Simultaneous Auctions
with Combined Value Bidding:
Contingent Bids

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Introduction

Consider a simultaneous auction for non-identical assets, such as the simultaneous multi-round auction the FCC uses to sell spectrum licenses. Adjusting the rules to allow for combined value bidding may notably improve the allocative efficiency of the auction. That is, allowing a bidder to submit a single bid for a combination of licenses may make the auction more effective in allocating licenses to highest-valuing bidders. Potential computational problems and other complexities can be avoided by designs that permit "package" bids on only certain combinations, presented in Rothkopf, Pekec and Harstad [1996, 1998] (below, RPH).

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[1] The ideas presented here were developed and refined in association with Ronald Harstad; we plan to do further work on contingent bidding together.

In particular, the RPH suggestion of "rows and columns" forms the basis of the proposal currently before the FCC for the 700 MHz auction. Under that proposal, bidders could bid on any of the 12 licenses a 10-MHz license and a 20-MHz license in each of 6 geographic regions, or on a row, or column, or the global set. A column bid is a combined bid on both the 10-MHz and 20-MHz licenses in a region, e.g., New England. Six regions means six different column bids. A row bid is a combined bid on all licenses of the same capacity, across all regions, either all six 10-MHz or all six 20-MHz licenses. The global bid is a single bid across all regions and both capacities, that is, for all 12 licenses.

Allowing single bids on rows, columns, and on all licenses can in theory introduce a problem that could not have happened if bidders could only bid on individual licenses, as before. The problem is called the threshold problem, described via example below. We have seen no evidence in technical presentations and ex parte filings for the 700 MHz auction that would imply nonnegligible concern with the threshold problem for this auction.

Hence, if bidders' options had to be restricted in order to deal with the threshold problem, as would happen with the McAfee-Milgrom proposal of bid composition restrictions (Milgrom [2000a,b]), we would consider that substantial overkill in view of the scant evidence. Several commentators at the recent Wye Woods conference supported the notion that bidders should be given expanded options, and that, to the extent possible, the bidders should determine the outcome, not the rules.

However, if there is sufficient concern that the threshold problem might arise, we offer a simple mechanism that can deal with the problem, while at the same time expanding bidders' options, rather than restricting them. We call this option contingent bidding, although the specific proposal is perhaps more restrictive than that phrase might suggest to some.

An Illustration

Suppose the following are part of the results at the end of round 7. All numbers are fictitious, used only to give a concrete example. In the individual 20-MHz licenses, bidder 1 holds the high bid on the CM license at $15; bidder 2 holds the high bids on the SE, GL and PA licenses at $30, $20, and $40, respectively; and bidder 3 holds the high bids on the NE license at $30 and on the MA license at $40. The 20's-row (package) high bid is held by bidder 4 at $210. At round 8, we assume the FCC is calling for minimum bid increments of 5%.

Bidders 1, 2 and 3 face the problem that their six high bids sum to $175, so they must collectively increase their bids past a threshold of an additional $35 (20%) in order to compete with the 20's-row bid of bidder 4. This is the threshold problem, and it can be a serious problem for allocation of licenses if the values of the six licenses

to their current individual high bidders exceeds the value of the package of all six to bidder 4, but no one bidder among bidders 1, 2 and 3 can afford to, and is willing to, increase his bid(s) on the licenses he owns by $35 on his own. Even if efficiency would call for bidder 4 to obtain all six licenses, or for the global bidder to obtain all 12, revenue may be hurt (with efficiency consequences) if bidders 1, 2 and 3 do not compete further, due to each being unwilling to put an additional $35 on the table.

The seriousness of this threshold problem can only sensibly be understood in the context of a secondary market with market frictions that are neither negligible nor overwhelming. One solution is for bidder 2 to internalize the externality, by bidding $220.50 for the 20's-row package himself, planning after the auction to sell to bidders 1 and 3 the licenses where they are currently high bidders. However, it may be preferable for the auction rules to give the bidders additional means to try to raise their bids into competition with bidder 4, within the auction itself, rather than rely on the secondary market.

We propose allowing bidders to submit contingent bids of a particular type, subject to particular minimum bid rules. Adapted to the rows-and-columns format, a contingent bid could be of the following form: "I raise my bid on the CM 20-MHz license by 30% contingent on the event E: that the sum of the bids on the six 20-MHz licenses rises by at least 26%." In general, a contingent bid, for a rows-and-columns auction, specifies a license, a bid on that license (whether a percentage increase or a dollar increase or a dollar amount is methodologically irrelevant; for our purposes here, the rules are most cleanly explained when the bid is expressed as a percentage increment), and an event upon which that bid is contingent. The event must be a specified minimum increase in a set of licenses, including the license bid on, that comprise a biddable package. Thus, a bidder can propose to increase a bid by some percentage provided the sum of bids in the same row rise by some (possibly different) percentage, as in the example given. Alternatively, a bidder can propose to increase a bid by some percentage, provided the sum of bids in the same column increases by some percentage (in this case, there is only one other bid involved in the event). Finally, a bidder could propose to increase a package bid by some percentage contingent on the sum of bids on the corresponding set of packages going up by some percentage. There are two such cases: a row bidder specifying that his row bid and the other row bid (or the maximum of the individual bids in the other row) increase by some percentage, or a column bidder specifying that the six maxima of column bids and column sums themselves sum to a specified percentage increase. These two cases are attempting to overcome potential threshold problems in the rows and columns competing with a global bidder.

There will be restrictions on how the percentage specified in the event relates to the percentage a bidder proposes to offer himself, which we consider momentarily.

First, we must specify what bid retention rules apply to contingent bids. We propose they be the same as noncontingent bids: a contingent bid is retained if, were the contingency met, [a] it would be acceptable or standing, and [b] for a package bid only, it would be part of a columns maximum or a rows maximum. Should a contingency be met, all bids expressing that contingency become noncontingent, without any opportunity for reconsideration by the makers of those bids.

In the above situation, the three bidders must raise the sum of their bids by 20% to reach the standing 20's-row bid. If they are to exceed a minimum bid increment, in this case reach a sum that is 5% above that 210 bid for the 20's row, the sum of their bids must increase by 26%.

Suppose the six bids must increase by 20% to be considered competitive. If no bidder is willing to increase his bid on one of the six licenses by 20%, the threshold will not be overcome. Hence, we see no point in allowing a contingent bid for an event not yet used that specifies a smaller percentage increase in his bid than the percentage expected in the contingency.

In this situation, if a bidder wished to take the *new* event E that the sum of bids on the 20's licenses were to rise by at least 20%, the bid he makes that is contingent on this event is itself subject to the same percentage as a minimum bid increment.

However, the unwillingness or inability of any one bidder to increase his own bid by the required percentage ought not to doom the contingency. It may be that bidder 1 has a budget constraint of $16, and so cannot raise his $15 bid by 20%. It may also be the case that bidder 1 decides strategically to bid as if he had a $16 budget constraint; that he had some budget constraint would be presumed by all bidders, but how high it was would be his own private information.

In such a situation, we would not allow bidder 1 to submit a bid to get the ball rolling. But once such a bid was submitted, he would be allowed to submit such a bid to keep the ball rolling. That is, 1's bid of "I raise my bid on the CM 20-MHz license by 6% in the event E that the sum of bids on the six 20's rises by at least 20%" would be rejected as not meeting the minimum bid requirement for a new contingency.

However, suppose bidder 2 submits a contingent bid in round 8 specifying an increase of 20% on his bid for PA-20, in the event E that that the sum of bids on the six 20's rises by at least 20%. So long as no 20% or larger increase in the noncontingent bid on the PA-20 is submitted in round 8, this contingent bid by bidder 2 becomes a standing bid.

Then in round 9 bidder 1 would be allowed to submit his contingent bid of a 6% raise contingent on a 20% raise of the sum of bids, because he is specifying the same contingency as that in a current standing bid. When specifying the same contingency, a bidder can make any contribution which is at least as large as the minimum bid on the license or combination he is bidding on—here the PA-20. Other bidders and the

FCC will never know for sure whether a bidder who proposes to offer a smaller percentage than needed for the sum is indicating a bid limit or exposure limit, or is behaving strategically. However, once the contingency is standing, any increase he makes gets the contingency closer to being fulfilled.

If the bidders are to succeed in overcoming the threshold, at some point one bidder will decide that the various contingent bids are close enough that it is worthwhile for him individually to take it over the top. It is possible that the 6% increment by bidder1 could be enough to get bidder 2 or 3 to do just that.

The Proposed Additions to the Rules

A bidder could submit a percentage increase in a standing bid on a license (his own standing bid or a competitor's) and make that bid contingent on an event. The event must be that the sum of bids, in either that row or that column containing the license, increase by a percentage which the bidder specifies.

A bidder could also make a percentage increase in a row bid contingent on a specified percentage increase in the sum of that row bid and the maximum of the other row bid and the sum of individual bids in the other row. Similarly, a bidder could make a percentage increase in a column bid contingent on the sum of the column-by-column maximums of each column bid and the sum of bids in that column increasing by a specified percentage.

When there is no standing bid on a license, a contingent bid must propose a bid on that license which is at least the current minimum bid. When there is a standing bid, and the event upon which the bid is contingent is not present in any standing bid, the minimum increase for a contingent bid is the percentage increase specified in the contingency. When some standing bid already specifies the same contingency, the minimum bid on that license is also the minimum bid for the standing contingency.

We believe this provides the tool needed to overcome the threshold problem when it can be overcome. If a contingency is specified in some standing bid, and the contingency is not reached within four rounds, we suspect it has been given its fair due, and that threshold is truly beyond the limits to which those bidders are willing to go. All of this presumes that the threshold problem is deemed serious enough to warrant some additional tool. More complicated tools than contingent bids seem to us unwarranted.

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